

SPATIAL STRUCTURE IN A STONE CRAB POPULATION (BRACHYURA: XANTHIDAE) AND THE INTERPLAY WITH RESOURCE MOSAICS

For large, motile, den-dwelling decapods (e.g. clawed and spiny lobsters) habitat should be considered a mosaic of resource patches. Patchiness affects access to resources which, in turn, affects mating patterns within populations (Emlen and Oring, 1977). For some small brachyurans, patchiness of refuge or premium burrowing sites factors into male mating success (Christy, 1983; Diesel, 1986; Abele *et al.*, 1986). We asked if population structure of commercially important stone crabs would vary with refuge patchiness sufficiently to exclude alternative mating strategies as defined by Christy (1987).

Methods

Refuge spatial patterns were manipulated as a split-plot experimental design for a population of hybrid stone crabs (*Menippe mercenaria* x *M. adino*) in the northeastern Gulf of Mexico. Six interspersed treatment plots each contained 36 prefabricated reef modules in either a widely spaced (60m), uniform pattern, a closely spaced (2m) uniform pattern, or an intermediate, mixed pattern, i.e. 6 widely spaced clusters, each with 6 closely spaced modules. In September and October, 1987, 12 randomly selected modules were non-destructively sampled on each plot. In late August and early October, 1987, one block of treatment plots was exhaustively but non-destructively sampled ($n = 36$ modules/plot). That same block was exhaustively sampled monthly from August 1988 through July 1989. Data for each crab included specific den location, tag identification, sex, carapace width, and phenotypic index according to Bert and Harrison (1988).

Summary of Results

Phenotypically, this hybrid population most closely resembled *M. mercenaria*. In 1987, widely spaced modules harboured more crabs than did closely spaced modules or those in an intermediate, mixed pattern. Widely spaced and mixed modules also tended to harbour larger males and females, although differences were not significant for every sampling period. Sex ratios did not differ among treatments, yet widely spaced modules harboured more mated pairs than expected from the distribution of males among plots.

Crabs left the study site during late summer and fall 1988 as *Octopus vulgaris* invaded plots. Treatment effects re-emerged following spring 1989 recolonisation by adult crabs. Crabs tagged in 1989 were not long-term den residents, but resightings were greater than expected by chance on the wide plot. Females were resighted more often than males. Only 5 of 100 tagged males were resighted, three resighted just once, and two large males (122 mm and 110 mm CW) found repeatedly in different wide-plot modules with different females.

Discussion

Differences in crab abundance may be explained by differential prey depletion on soft-bottom as a function of refuge spacing and distance from refuge (Lindberg *et al.*, in press; Frazer and Lindberg, unpubl.). Refuge value apparently

changes with access to prey, and the resultant mosaic then influences residency patterns by size and sex.

Low site fidelity by males compared to females and multiple male occupancy of modules (Wilber, 1989a; and herein) precludes a resource-centred male mating strategy. Protracted mate guarding (Wilber, 1989b) also impugns an encounter-rate-competition male strategy. The greater per capita mating success of males on wide plots, and resightings of few large males amidst numerous females is consistent with either a female-centred, patrol-and-defend strategy or a search-and-defend strategy influenced by patterns of food and refuge.

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